Spectroscopy of Molecular Oxygen in 1 he At mosphere of Venus

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Current Venusian atmospheric chemistry models [e.g., Sze & McElroy, *J Planet. Space Sci.* (197.5), Winick & Stewart, *JGR* (19X0). Yung & DeMore, *Icarus* (1982), Krasnopol'sky & Parshev, *Venus* (1983)] have identified chemical cycles that use H, Cl, and S compounds to catalyze the reformation of CO_2 from its photodissociation products (CO and O_2). These models predict that O_2 should be a minor, but detectable, constituent of the Venus atmosphere (column mixing ratio in the mesosphere of $\sim$ 1.5- 3.5 x 10- ^{6} from the Yung & DeMore model). In addition, repeated observations since 1975 of intense O_2 airglow in the IR atmospheric bands near 1.269 μm have shown that ground-state O_2 is produced in the Venus nightside mesosphere at a rate comparable to that at which CO_2 is photodissociated on 1 he dayside [Connes et al, *Ap. J.* (1979), Crisp et al, *JGR* (1996)]. Nevertheless, all attempts to measure O_2 abundances in the mesosphere have been unsuccessful. The current upper limit is 3×10^{-7} [Trauger and Lunine, *Icarus* (1983)].

Speculation has suggested that O_2 might have been depressed at the time of Trauger and Lunine's observations since SO_2 abundances declined by a factor of 8 from 1979 - 1988 [Esposito et al, *JGR* (1988), Na et al, *JGR* (1990)] and have since declined further [Na et al, DPS Conference (1995)]. If th is were correct then O_2 might now be detectable.

We used the AAT's UHRF [Diego et al, *Mon. Not. R. Ast. Soc.* (1995)] to attempt to detect O_2 in the Venus mesosphere by observing the 763.6325 and 763.2165 nm lines at spectral resolving power ($\lambda/\Delta\lambda$) of 600,000 using the 1.5" square image slicer [Diego, *App. Opt.* (1993)].

Our preliminary analysis finds no detectable absorption from O_2 in the Venus mesosphere. Analysis of one morning's spectra gives a maximum line depth ($\Delta I/I$) of $\leq$ 0. 00S (equivalent width of $\sim$ 0. I m$\AA$). Scaling from Trauger and Lunine's calculations gives a column mixing ratio of $\leq$ 3 $\times 10^{-6}$, indicating the smaller SO_2 abundance may not have significantly affected the abundance of O_2 in the Venus mesosphere.

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